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DE RUEHLS #0744/01 2000603  
ZNR UUUUU ZZH  
R 180603Z JUL 08  
FM AMEMBASSY LUSAKA  
TO RUEHC/SECSTATE WASHDC 6070  
INFO RUEH KI/AMEMBASSY KINSHASA 0514  
RUEHSA/AMEMBASSY PRETORIA 4929  
RUCPDO/DEPT OF COMMERCE WASHDC  
RHEBAAA/DOE WASHDC  
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TAGS: [EMIN](#) [ENRG](#) [EINV](#) [EIND](#) [ETRD](#) [ELAB](#) [CG](#) [ZA](#) [SF](#)  
SUBJECT: ZAMBIAN COPPER BELT BLOOMS, BUT CHALLENGES REMAIN

REF: A) LUSAKA 666  
B) LUSAKA 376  
C) KINSHASA 515

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¶1. (U) This cable represents the fourth in a series of reports stemming from an innovative resource-reporting and commercial advocacy collaboration between Embassies Pretoria, Kinshasa, and Lusaka (reftels A and C and septel pending from Kinshasa). This cable summarizes mines visited in Zambia.

¶2. (SBU) SUMMARY: Copper and cobalt supply shortage and price escalation have provided the incentive for international mining companies to invest in new exploration and mega-projects in the Central African Copperbelt. The Copperbelt straddles the DRC/Zambia border and represents the world's second greatest source of copper, after Chile. Investment has flowed into the region, despite significant lack of skills and infrastructure, and an increasingly uncertain power supply. In Zambia, recent tax legislation and changes to existing development agreements between mines and the Zambian government have introduced uncertainties for investors, which could have major negative implications for new investment. Nevertheless, companies intend to continue with short-term and major commitments because of the huge costs already incurred and long-term confidence in the geology.

¶3. (SBU) Earlier interpretations of the geology of the "traditional" Copperbelt envisaged a simple sedimentary-hosted copper deposit. More recent work has shown that the geology and mineral associations are much more complex, particularly in newer remote mines, and that mineralization differs from mine to mine. Much research is being concentrated on the remoter areas of the Lufilian Arc, which has opened up a whole new vista of exploration targets. The industry target for copper production in Zambia in 2009 is 750,000 tons, which will raise it to levels last achieved in the 1960s and 1970s when the Zambian Copperbelt consistently produced more than 700,000 tons of copper per year. End Summary.

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Mine Visits  
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¶4. (SBU) The collective Embassies' mining team visited the following mines and facilities in Zambia:

- Kansanshi open pit copper/gold mine owned by First Quantum Minerals Limited (FQ) of Australia/Canada (80 percent) and parastatal ZCCM (20 percent); capex \$360 Million;
- Lumwana open pit copper/uranium project owned by Equinox Minerals of Australia (94.45 percent) and ZCCM (5.55 percent); capex \$784 million;
- Bwana Mkubwe metallurgical plant processing oxide ore from Lonshi mine in the DRC and owned by First Quantum (100 percent); capex \$55 million; and
- Chibuluma underground copper/cobalt mine owned by Metorex of South Africa (85 percent) and ZCCM (15 percent); capex \$97 million.

¶5. (SBU) The mining team also drove by the Chinese Chambesi, Indian Vedanta Konkola, and Swiss Glencore/J&W Investments Mopani mines, where the team's formal requests for visits were not answered. The tour was greatly facilitated by First Quantum Minerals Limited (FQ) DRC Country Manager Jeffery Ovian who arranged the FQ mine visits, air and road transport, and accommodation at the company's guest house in Ndola, Zambia.

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Kansanshi Copper/Gold Mine  
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¶6. (SBU) Zambia's Kansanshi mine, located off the conventional Copperbelt, has ramped up copper production to become Zambia's largest producer, but it will be eclipsed by the more remote Lumwana mine under development (Ref B). FQ generously facilitated transfer of the embassy team from the DRC to Kansanshi, which is located in Zambia's northwestern province 10 kilometers north of the town of Solwezi. Mine Manager Russell Alley and his geologist hosted the tour of the mine facilities on May 15. Kansanshi was first mined in the fourth century AD and has been intermittently mined since. FQ bought the mining rights from Cyprus Amax Minerals in 2001 and began commercial production in April 2005. Kansanshi has a 25-year mining license and an estimated 30-year mine life.

¶7. (SBU) The Kansanshi deposit lies within the core of Lufilian Arc, but does not represent "conventional" Copperbelt geology or mineralogy. Mineralization is complex and occurs in the upper zone of the Copperbelt sequence, containing copper and gold, but no cobalt. Oxide ore occurs as a cap on and replaces sulfide ore in and below the sulfide zone where structural movements exposed ore to oxygen and water. The sulfide ore occurs both in and between steeply dipping, quartz-carbonate veins and vein swarms, and along bedding planes within the rocks of the mine formation. The ore body is shaped like a Christmas tree in section. Kansanshi's total ore reserve and resource estimate is 433 million tons (50 million tons of oxide cap), grading 1.16 percent copper (11 billion pounds) and 0.16 grams of gold per ton (2.2 million ounces). During phase one, or the first eleven years of the project, the grade will be higher at 1.74 percent copper and 0.27 grams of gold per ton. During phase two, the total ore reserve is expected to decrease to a mineable resource of 197 million tons grading 1.16 percent copper and 0.12 grams of gold per ton.

¶8. (SBU) Ore is produced from two shallow pits using conventional truck and excavator methods to produce oxide, sulfide and mixed ore streams. Plant capacity is 6 million tons of oxide ore and 8 million tons of sulfide ore per year, with overall recoveries of 80 percent. A third sulfide circuit is being built that will increase throughput to 12 million tons per year. Sulfide ore is treated in a conventional crushing-milling-floatation circuit to produce copper concentrate that is trucked to existing smelters on the Copperbelt.

The oxide ore is treated in a conventional acid-leach/solvent extraction/electro-winning (SX/EW) circuit to produce pure 99.95 percent cathode copper. Monthly output before expansion was 6,300 tons of copper in concentrate and 6,000 tons of cathode copper. Current monthly output is estimated at 6,250 tons of concentrate and 8,750 tons of cathodes. Some 105,000 tons per year of cathodes are exported via South Africa (80 percent) and Tanzania (20 percent) and this will increase to 140,000 tons when expansion is complete. Total copper output and future production estimates are:

Year	2005	2006	2007	2008	2009+
Copper (tons)	70,000	127,000	164,000	181,000	220,000

¶9. (SBU) A proportion of Kansanshi concentrate is being treated in a pressure oxidation process known as High Pressure Leach (HPL) that converts sulfide ore into an acid-leachable product amenable to the SX/EW process. This route eliminates the need for a smelter and allows for on-site production of a high-grade copper cathode. It also generates much of the sulfuric acid required for oxide leaching, currently at 400 tons per year, which will increase to 850 tons once expansions are completed this year. However, valuable by-products are lost in the HPL process and there could be an increase in energy consumption. The economics of the HPL process are being evaluated. The mine currently needs 80 megawatts of electricity (15 megawatts for the SX/EW plant) but is restricted to 75 megawatts due to power shortages. It has 20 megawatts of its own diesel capacity.

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Lumwana Copper/Uranium Mine Project  
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¶10. (SBU) The mining team visited the ambitious Lumwana Mine project in northwest Zambia on May 19 (Ref A). Lumwana is owned (94 percent) and operated by Equinox Minerals of Australia. Managing Director Harry Michael hosted the team and took great pride in showing off his \$165-million mining fleet of gigantic trucks, excavators and shovels. Most of the facilities visited have still to be completed, but the team was shown the \$408 million processing plant that will contain the largest grinding mills in the world, the new village to house 1,200 employees, the school for 2,000 children, and the shopping center that will normalize family life. The remoteness of the mine requires that Lumwana town provide most amenities in order to attract qualified people and families.

¶11. (SBU) Lumwana is noteworthy because of its very large -- but low grade -- copper resources, its high uranium content, and its lack of cobalt. The deposit lies in the middle of the Lufilian Arc some 220 kilometers west of Chingola and 80 kilometers west of Kansanshi mine. Two deposits are being developed for open pit mining and will use conventional open pit methods. Uranium occurs as younger, discrete deposits associated with copper. Three-quarters of the uranium occurs within the planned pit limits and will be selectively mined and stockpiled until a uranium plant is completed in mid-2010. The deposits copper/uranium association is fairly unique and comparable with Shinkolobwe in the DRC and Olympic Dam in Australia. The mine is currently in the final stages of development and September should see the first output of copper concentrate. Reserves and resources are:

	Million (Tons)	Grade percent
Copper Reserves (at \$1.20/lb)	321	0.73
U308 In-pit Resources (at \$11/lb)	7.2	0.083
Associated Copper	7.2	1.04
Total U308 Resources	9.5	0.093

¶12. (SBU) Lumwana will be the biggest surface operation and copper-producer in Africa when in full production next year (but will be over-taken eventually by Tenke Fungurume Mine in the DRC). Lumwana will also be the twentieth-largest copper producer in the world, and will add 35 percent to Zambia's copper output. The mine will deliver 169,000 tons of copper in concentrate per year for the first six years. The pits also contain a limited quantity of oxide

ore that is being stockpiled for future processing. The total estimated capital cost of the project is about \$780 million, which is the largest investment ever made in Zambia. Mine life is estimated to be 37 years, but known mineralization is extensive and production could continue far beyond that time. (Note: Because of the low grades and lack of cobalt in the ore, there has been no artisanal mining in the area. End Note.)

¶13. (SBU) All mining equipment is on site including twenty-seven 240-ton Hitachi/Euclid trucks, each costing \$4 million and requiring 2 megawatts of power, and seven Hitachi shovel/excavators, each capable of moving 700 tons per hour. Trucks are powered by diesel-electric motors, which allow for driving in the pit on diesel and connecting to overhead electric trolley cables (trolley assist) when hauling ore out of the pit. Ore from the pit will be hauled to a primary crusher at the top of the ramp and subsequently conveyed 4.5-kilometer to the milling circuit.

¶14. (SBU) Lumwana's process plant employs a conventional floatation circuit and should have been commissioned at the end of June, with first concentrate (30-40 percent copper) production taking place in September 2008. Unfortunately, fire damage to an electricity transformer

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on June 7 has delayed commissioning to an undetermined date. Some forty trucks per day will carry 1,200-1,400 tons of concentrate to two smelters on the Copper belt, on five-year off-take contracts. The plant boasts a number of superlatives, namely the world's biggest semi-autonomous grinding mill (SAG mill) and a similarly rated ball mill. Both are driven by concentric gearless electric motors (similar to an electric generator), which draw 18 and 16 megawatts of power, respectively. Each drive unit weighs in at more than 300 tons and the fully loaded SAG mill weighs 6,000 tons and rests on a base comprising 60,000 tons of concrete.

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Bwana Mkubwa Oxide Copper Processing Plant  
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¶14. (SBU) The embassies mining team visited the Bwana Mkubwa (BM) copper oxide processing plant on May 16. BM is located on the eastern edge of the "traditional" Copperbelt on the Zambian side of the border. The plant was the first major investment on the Copper belt following privatization of the mines in 1997 and is 100 percent owned by FQ. BM is a conventional oxide leach/solvent extraction/electro-winning (SX/EW) facility and was built in 1998 to process tailings from the old BM mine. The plant has produced cathode copper and sulfuric acid since 1998 for FQ company use and for sale in the region.

¶15. (SBU) FQ conducted exploration in the area to secure additional feed for the BM plant and discovered the Lonshi high-grade (8-10 percent copper) oxide deposit in the DRC, some 35 kilometers east of the plant across the border. The plant expanded its SX/EW capacity in 2002 to take an increased blended feed of Lonshi ore and BM mine tailings. BM produced 51,000 tons of cathode copper (99.95 percent fine) from 520,000 tons of ore grading 10.3 percent copper and 18.8 million tons of tailings in 2006, at a total cost of \$1.04 per pound. Production of copper cathodes was down nearly 50 percent to 25,400 tons in 2007, due to closure of the border to ore exports by DRC authorities who want ore beneficiated locally. Border closures and pending cessation of production at Lonshi are expected to further reduce BM output to only 12,000 tons in 2008. Thereafter, FQ will need to find other sources of oxide copper ore, convert the plant to process sulfide ores, or close the plant. BM had only one working SX/EW circuit at the time of the visit. Total cathode copper production is:

Year	2003	2004	2005	2006	2007	2008(est)
Copper(tons)	38,000	43,000	41,000	51,000	25,400	12,000

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Chibuluma (South) Underground Copper/Cobalt Mine  
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¶16. (SBU) The embassies mining team visited South African Metorex's Chibuluma (West) Mine on the Copperbelt on May 20. General Manager Ed Mounsey met and introduced the team to Mine Manager Jan Trouw who organized the mine and plant visit. Chibuluma South was discovered in 1969, nationalized by the GRZ in 1982, and was the first mine to be privatized in October 1997 when a Metorex consortium bought an 85 percent share from ZCCM, the government-owned mining company. It was also the first new underground mine to open on the Zambian Copperbelt in 30 years. The mine hosts a more conventional Copperbelt-type, high-grade primary sulfide orebody. It ranges in thickness from 10 to 40 meters, with an average 15 meters, has a strike length of 400 meters, and extends to a known depth of 600 meters. Ore reserves consist of 7-8 million tons grading 3.6 percent copper and 0.3 percent cobalt, with a production life that extends to about 2016. It also contains a small percentage of oxide in the upper levels that is stockpiled for later processing.

¶17. (SBU) the mine's primary ore is thought to be sedimentary in

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origin with later quartz vein enrichment. Access to the mine is via a decline spiral ramp from the surface that allows motorized vehicles, equipment and personnel to drive into and out of the mine.

Some 40,000 to 50,000 tons of ore is mined and processed per month. Chibuluma employs a fairly conventional cut-and-fill mining method, with rib and buttress pillars to support the hanging roof, stabilize the mine, and prevent dilution from upper levels and the worked-out open pit. Mining voids are filled using prepared tailings from the process plant, which are then pumped into cleaned open stopes. It may be possible in the future to recover high-grade ore contain in the supporting pillars.

¶18. (SBU) The Chibuluma South metallurgical plant was designed as a conventional, three-stage crushing, milling and flotation process with separate circuits for oxide and sulfide ores. When oxide ore was mined in the open pit, a mix of copper and cobalt was recovered and the oxide ore was "sulfurized" to render it amenable to floatation and concentration. Cobalt-hydrate concentrate was also produced and sent to Metorex's Sable refinery, north of Lusaka. Current processing of deeper sulfide ore produces a 40 percent copper concentrate that is sent to the Chingola smelter for casting into copper anodes containing 99.5 percent copper. The oxide treatment plant is currently idle but is maintained for future processing of 60,000 tons of stockpiled ore grading 2.5 percent copper, oxide ore to be mined at Memorex's Chifupu development, and stockpiles at other mines without the requisite processing facilities. Total ore, concentrate and copper production is:

Production:	2005	2006	2007	2008(est)
Ore(est. tons/mo)	14,000	25,000	45,000	48,000
Conc(tons/mo)	850	1,500	2,900	3,100
Copper in Conc(tons/yr)	4,400	7,700	15,400	15,000

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Social Commitments - a License to Mine  
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¶19. (SBU) All mines on the Copperbelt, and especially in the remote areas, are committed to programs of social development and upliftment on the mines and in the surrounding communities. This has become a worldwide requirement as most mines are in poor and underdeveloped rural areas. The mines would lose their "social license to mine" and encounter labor and community unrest without such programs. All mines visited have programs in place, generally tailored to the particular needs of the local communities. Provisions include mine housing, medical care, educational, power, water, road and rail, social infrastructure, nutrition schemes, recreational facilities, subsidizing salaries for teachers and medical staff, and subsidizing small business projects by providing the facilities, materials and markets for products such as brick-making, vegetables-growing, Jatropha-growing for bio-fuels, and briquette-making using Jatropha residues. A major feature of the social programs is the great effort being put into training locals, who in most instances have limited exposure to the techno-industrial world. Companies have committed to training and hiring locals to fill most of their mining positions.



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Challenges Facing Copper Mines  
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¶20. (SBU) The mining industry faces numerous challenges in Zambia, but industry appears to have considered the risk surmountable because of the size, abundance and quality of the copper/cobalt resource-base and the international price of these commodities. Unfortunately, the investor-friendly image projected by Zambia since privatization in 1997 has been tarnished by the GRZ's recent unilateral implementation of its new tax regime and mining code. Industry leaders liken this to "nationalization by taxation" in that

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they calculate that the government take is likely to far exceed returns to investors. They also complain that industry no longer has any say or input into government policy-making. This has resulted in a wait-and-see investment slow-down. Anecdotally, a number of projects have been put on watch and exploration has been put on hold pending the eventual outcome of government-industry negotiations.

¶21. (SBU) The remoteness of some mines and their potential long life have necessitated that management take a long-term view of the need for skills, social amenities, infrastructure and utilities. As a result, Kansanshi has built housing and Lumwana is building a new town with recreation and shopping facilities, housing, schooling, and extensive training opportunities for local employees, most of whom have no mining or industrial experience. The key challenges include: lack of skills and training requirements; overcoming cultural differences and tribal xenophobia; obtaining permits to import specialist skills; remoteness of mines and the lack of adequate, reliable infrastructure; cost of operations; delays in obtaining operating licenses and permits; government expectations beyond mine social development; DRC/Zambia cross-border restrictions; lack of smelting capacity in the Copperbelt; and supply logistics, and infrastructure to attract skilled workers.

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Comment  
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¶22. (SBU) Mines are the most significant development nodes in Zambia and the increase in mining activity since privatization is evident in the relatively better quality of life in mining towns. Road, rail, smelter and power infrastructure and skills availability are generally inadequate, but the mines cope by investing themselves in new facilities, undertaking maintenance and repair, building social capacity, and supporting massive skills training programs. A new Chinese smelter is also being built at Chambesi on the Copper belt and, together with expansions to three others, Zambia will have a total annual smelting capacity of nearly 300,000 tons of blister and anode copper by about 2009 (almost half of Zambia's estimated copper concentrate production).

¶23. (SBU) The recent upsurge in apparent Zambian "resource nationalism" has led to what appears to be a poorly thought-out and, according to operators, overly onerous fiscal regime and mining code. This has introduced a higher level of uncertainty and risk, which could slow private investment. Companies take a longer-term view of this as a cyclical phenomena resulting from high commodity demand and prices. Mining companies are likely to continue to invest in exploration and development of new mines in Zambia, as long as the ample geological potential favors long-term good returns, and short of outright nationalism.

Martinez